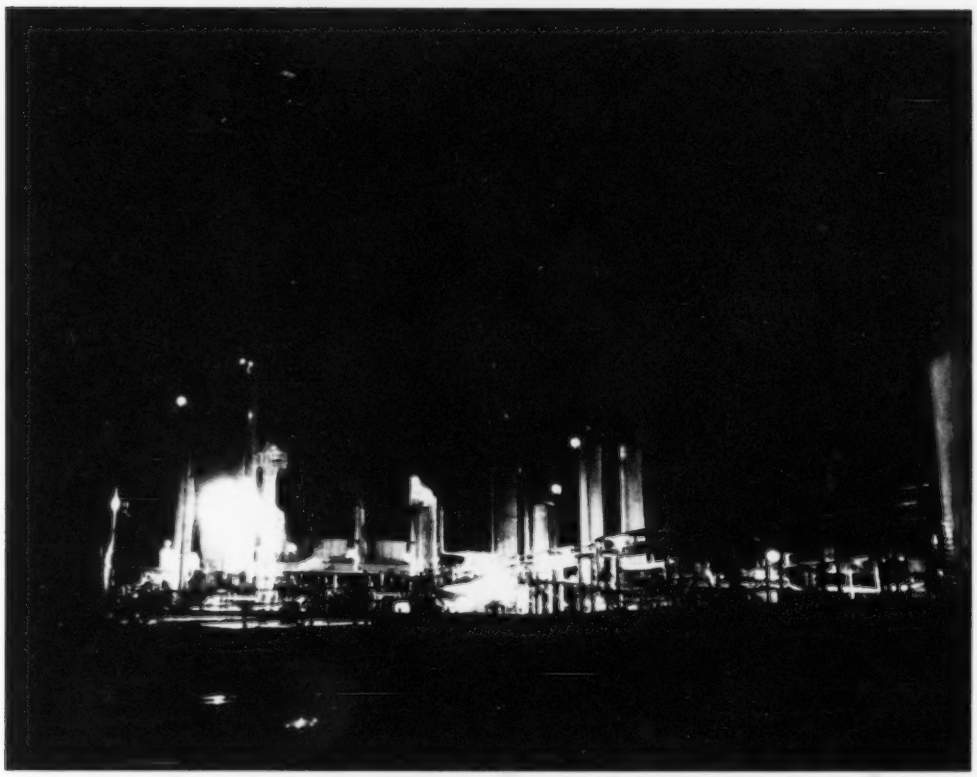
ST101-2010

ERCB

Sulphur Recovery and Sulphur Emissions at Alberta Sour Gas Plants

Annual Report for the 2009 Operating Year

July 2010



Energy Resources Conservation Board

ENERGY RESOURCES CONSERVATION BOARD
ST101-2010: Sulphur Recovery and Sulphur Emissions at Alberta Sour Gas Plants for the 2009 Operating Year

July 2010

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1 Introduction

The Energy Resources Conservation Board's (ERCB's) annual summary report on industry performance regarding sulphur recovery and sulphur emissions for conventional sour gas plants is published in accordance with *Interim Directive (ID) 2001-03: Sulphur Recovery Guidelines for the Province of Alberta* as part of its commitment to monitor the sulphur recovery of grandfathered[1] sour gas plants. This report covers both grandfathered sour gas plants (sulphur recovery and larger acid gas flaring sour gas plants) and nongrandfathered[2] sour gas plants (sulphur recovery and acid gas injection sour gas plants). Complete lists of the grandfathered and nongrandfathered plants are in Appendices 2.1 through 2.4.

While *ID 2001-03* did not change the recovery levels expected for new gas plants, it set out clear requirements on when older grandfathered plants must meet the same requirements as new plants. The ID incorporated a phased approach to the more stringent requirements and encouraged operators of sulphur recovery plants to take early action to improve performance. The ID allowed older plants that were reducing throughput by 7.5 per cent each year (and thus emissions) to continue to operate under their existing approvals until December 31, 2016, at which time grandfathering would end for all plants.

Grandfathered sulphur recovery plants that perform better than the minimum requirements specified in *ID 2001-03* have the option to file sulphur emission performance credit report forms and may use the credits to meet a portion of the sulphur recovery requirements at a future date (i.e., operate for a longer time or at a higher inlet rate before having to degrandfather the plant). All grandfathered sulphur recovery plants are taking advantage of the emission credit program, and credits continue to increase every year.

Acid gas flaring plants have no ability to earn credits and are subject to more stringent requirements over time.

In the last ten years, a number of plants have been degrandfathered:[3] 16 plants have made modifications, 14 plants have been relicensed to meet the requirements for new plants, and 9 plants have ceased operating. There are 21 grandfathered plants remaining.

Sulphur emissions have decreased substantially from 2000 to 2009 for both grandfathered acid gas flaring plants (emissions down 78 per cent) and grandfathered sulphur recovery plants (emissions down 58 per cent). In the last year, emissions have decreased for both grandfathered acid gas flaring plants (emissions down 12 per cent) and grandfathered sulphur recovery plants (emissions down 13 per cent).

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[1] Grandfathered plants are those that do not meet the sulphur recovery requirements for new plants listed in *ID 2001-03*. This includes some sulphur recovery plants and larger (sulphur inlet greater than 1 tonne per day [t/d]) acid gas flaring plants. All grandfathering will end by December 31, 2016).

[2] Nongrandfathered plants are those with an approved sulphur inlet greater than 1 t/d meeting the requirements for new plants, as listed in *ID 2001-03*. This includes both sulphur recovery plants and acid gas injection plants.

[3] Degrandfathered plants are those that did not previously meet the requirements of *ID 2001-03* for new plants but have now been relicensed to meet the requirements for new plants, as set out in the ID.

2 Summary of Performance for Grandfathered Plants, 2000-2009

2.1 Grandfathered Plants That Have Been Degrandfathered

In the last ten years, 16 plants have made modifications to improve or install sulphur recovery to meet the more stringent sulphur recovery requirements for new plants. In addition, 14 other plants have been relicensed to meet these more stringent sulphur recovery requirements and 9 grandfathered plants have shut down. Further details on these plants are in Appendix 1.

When plants make modifications to their facilities or licensed operating values, they may be required to degrandfather as part of the relicensing process to meet the sulphur recovery requirements for new plants as set out in *ID 2001-03*, Table 1.

Plants degrandfathered in 2009 include

1) Nordegg (Brazeau River) – Keyera Energy Ltd.
2) Waterton – Shell Canada Limited
3) Zama – Apache Canada Ltd. (shut down)

As of December 2009, there were 12 grandfathered sulphur recovery plants and 9 grandfathered acid gas flaring plants remaining (see Appendix 2).

A detailed list of plants that have been degrandfathered in the last ten years is in Appendix 3, along with the process used for improving sulphur recovery.

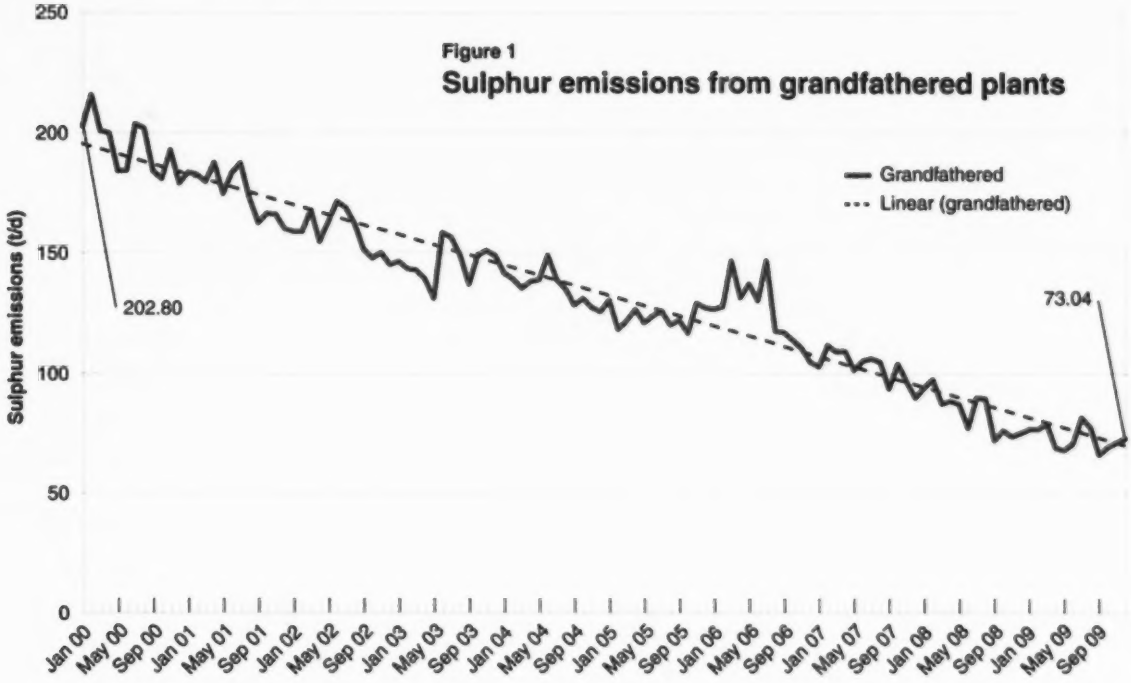
2.2 Sulphur Emissions and Inlets at Grandfathered Plants, 2000-2009

An analysis of the sulphur emissions and sulphur inlet for the specific plants listed in *ID 2001-03* as grandfathered follows in Sections 2.2.1 and 2.2.2. For the purpose of this analysis, plants that have been degrandfathered since *ID 2001-03* was issued are included with the grandfathered plants.

2.2.1 Sulphur Emissions Reduction

The grandfathered plants substantially reduced sulphur emissions from 2000 to 2009, as shown in Figure 1.

The 62 per cent drop in emissions from grandfathered plants from the 2000 baseline year to 2009, shown in Figure 1, is due to a decrease of about 78 per cent in emissions from the grandfathered acid gas flaring plants and a decrease of about 58 per cent from the grandfathered sulphur recovery plants.



As can be seen in Figure 1, there was a significant decrease in emissions (about 13 per cent) from the grandfathered plants from 2008 to 2009. This decrease was due in part to notable improvements in sulphur recovery at Talisman Edson, Nexen Balzac (Crossfield), and Husky Strachan (Ram River), together with a decrease in inlet.

The 78 per cent decrease in emissions from grandfathered acid gas flaring plants from 2000 to 2009 was accompanied by a 43 per cent decrease in sulphur inlet. The decrease in emissions is due in part to acid gas injection facilities installed at Apache Hope Creek (Virginia Hills), ConocoPhillips Vulcan (Long Coulee), Pengrowth Judy Creek (Swan Hills South), Harvest Operations Bellshill Lake, Taylor Management Turin (Retlaw), and AltaGas Bantry and the installation of sulphur recovery at Petro-Canada Wilson Creek. Between 2000 and 2009, all 28 of the grandfathered acid gas flaring plants showed emissions reductions.

The 58 per cent decrease in emissions from grandfathered sulphur recovery facilities from 2000 to 2009 was accompanied by a 46 per cent decline in sulphur inlet. The decrease in emissions is due in large part to plant modifications and/or improved operations at Husky Ram River (Strachan), Semcams Kabob South 3, Shell Waterton, Semcams West Whitecourt (Windfall), Shell Jumping Pound, Keyera Brazeau River, and Shell Burnt Timber. Of the 28 grandfathered sulphur recovery plants, 26 reduced emissions from 2000 to 2009, as shown in Appendix 4.1.

Appendix 4 lists sulphur production and emissions for each of the sulphur recovery plants for the years 2000 and 2009.

2.2.2 Decline in Sulphur Inlet

Improvements in operation and plant modifications have played a significant role in emissions reductions at the grandfathered plants. As noted above, the overall decrease in emissions is also due to a 46 per cent decline in the sulphur inlets of these plants from 2000 to 2009, as shown in Figure 2.

As also shown in Figure 2, there was about a 19 per cent decrease in the sulphur inlets of the grandfathered plants from 2008 to 2009. This was primarily due to a decrease in throughput at four facilities: Husky Ram River (Strachan), Semcams Kaybob South 3, Shell Jumping Pound, and Semcams Kaybob South 1 and 2.

Figure 2 shows the overall decline in sulphur inlets of grandfathered gas plants.

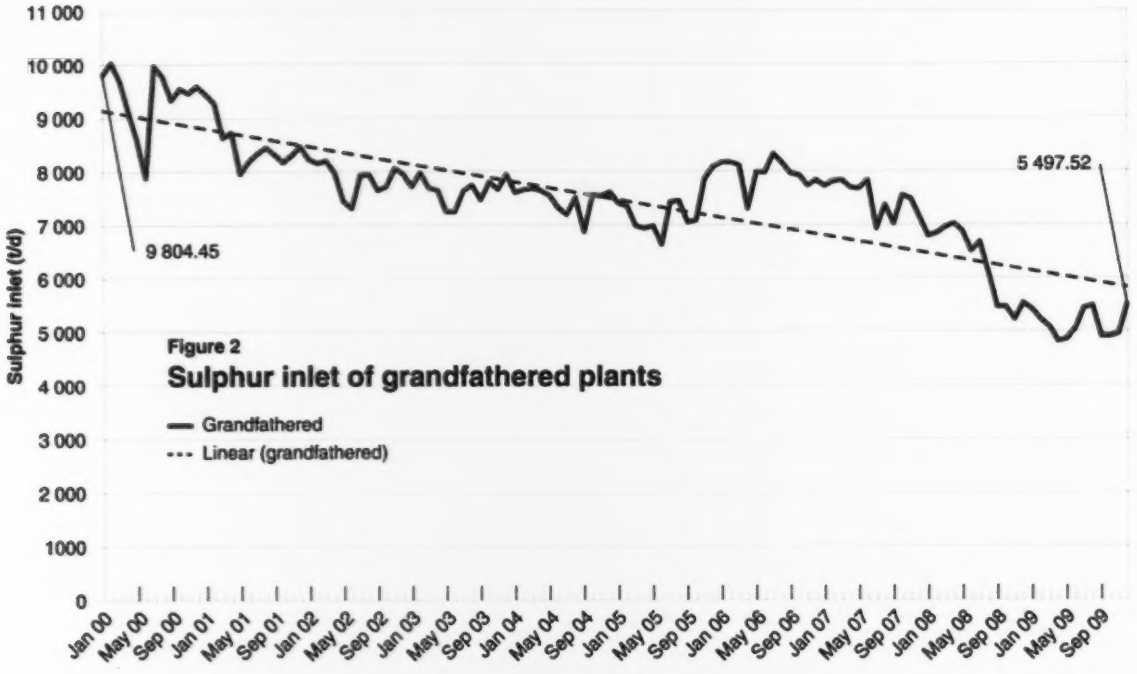


Figure 2
Sulphur inlet of grandfathered plants

2.3 Sulphur Emission Performance Credits

Sulphur emission performance credits (emission credits) can be earned by grandfathered sour gas plants with sulphur recovery that achieve recovery efficiencies higher than their required blended sulphur recovery efficiency. Each emission reduction credit earned may be applied as the equivalent of 1 t of sulphur not emitted. Credits may not be transferred between facilities and do not apply to acid gas flaring plants.

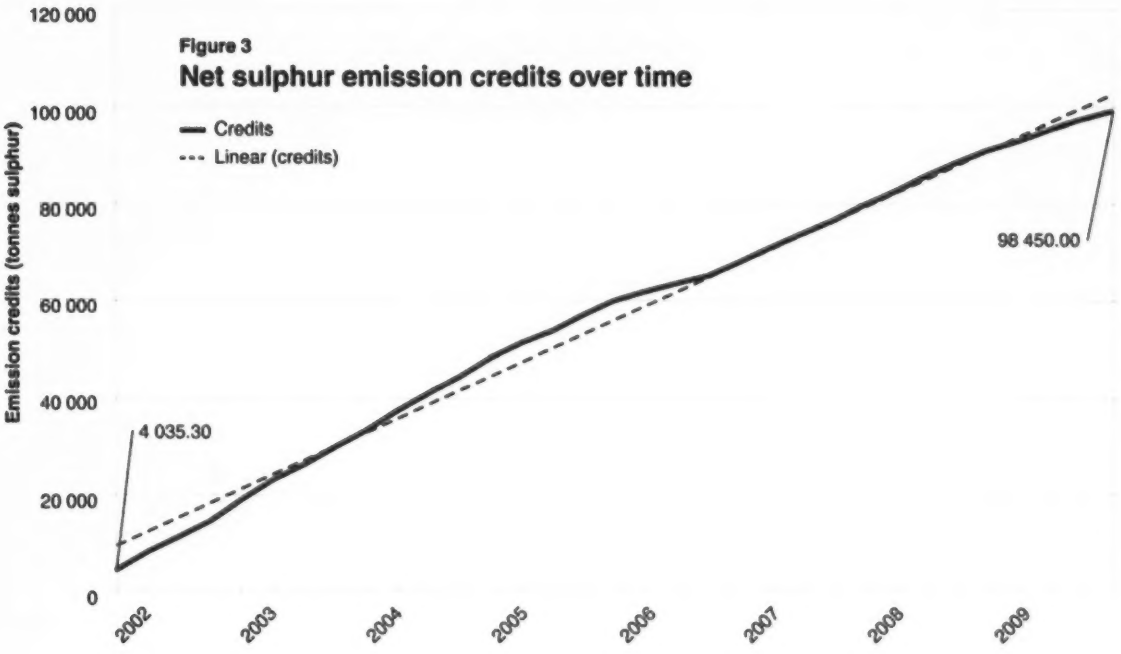
Credit reports can help an operator

- operate at higher sulphur inlets,
- meet the required blended sulphur recovery efficiency, and
- defer upgrading for a longer period of time.

Each emission credit represents 1 t of sulphur emissions that would have been emitted if the plant exactly met its minimum requirement. Credits must be earned before they can be used.

All plants that are able to file credit reports are doing so, and the emission credits are still increasing. As of the end of the fourth quarter of 2009, about 98 500 t of sulphur emission credits had been earned (see Figure 3 and Appendix 5). The total sulphur emissions from grandfathered sulphur recovery plants in 2009 was 23 500 t. Emission credits as of December 2009 equate to about 50 months of emissions from the grandfathered sulphur recovery plants.

Figure 3
Net sulphur emission credits over time



Appendix 5 lists quarterly credits earned and cumulative credits for each of the grandfathered sulphur recovery plants in 2009.

3 Summary of Performance for Nongrandfathered Plants, 2000-2009

The ERCB also examined the sulphur emissions and sulphur inlet of each sour gas plant that had a sulphur inlet greater than 1 t/d and that met the requirements for new plants when *ID 2001-03* was issued.

The drop in sulphur emissions from these nongrandfathered plants was about 46 per cent between 2000 and 2009. The reduction in sulphur inlet was about 40 per cent over the same period. Details on these reductions on an individual plant basis for plants with sulphur recovery are given in Appendix 4. From 2008 to 2009, emissions dropped about 10 per cent, while sulphur inlet dropped about 9 per cent.

4 Summary of Overall Performance for Grandfathered and Nongrandfathered Plants, 2000-2009

Examining the sulphur inlet and sulphur emissions of both the grandfathered acid gas flaring and sulphur recovery facilities and nongrandfathered acid gas injection and sulphur recovery facilities reveals a 59 per cent drop in emissions from 2000 to 2009, together with a reduction in sulphur inlet of 43 per cent. From 2008 to 2009, emissions dropped about 12 per cent and sulphur inlet dropped about 14 per cent.

Appendix 1 Grandfathered Plants That Have Been Degrandfathered, 2000-2009

In the last ten years, 16 plants have made modifications to improve or install sulphur recovery to meet the more stringent sulphur recovery requirements for new plants in *ID 2001-03*. In addition, 14 other plants have been relicensed to meet these more stringent sulphur recovery requirements, and 9 grandfathered plants have shut down.

The 16 plants listed below had significant physical modifications to their plants to achieve higher sulphur recoveries.

Plants making modifications to meet the requirements for new plants

Plant name	Operator
1. Brazeau River	Keyera
2. Garrington (Olds)	Esprit
3. Homeglen (Rimbey)	Keyera
4. Bantry	AltaGas
5. Vulcan (Long Coulee)	ConocoPhillips
6. Wilson Creek	Petro-Canada
7. Rainbow	Husky
8. Edson	Talisman
9. Retlaw (Turin)	Taylor Management
10. Virginia Hills	Apache
11. Bellshill	Harvest Operations
12. Simonette	Suncor
13. Swan Hills South (Judy Creek)	Pengrowth
14. Kaybob South 3	Semcams
15. South Rosevear	Suncor
16. Nordegg (Brazeau River)	Keyera (2009)

Of the 14 plants listed below, 4 were relicensed to a higher sulphur recovery efficiency with existing equipment and/or minor modifications and 10 were relicensed to a lower throughput without modifications.

Plants relicensing to meet the requirements for new plants

Plant name	Operator
1. Okotoks (Mazeppa)	MPP
2. Crossfield East	Primewest
3. Sylvan Lake	NAL Resources
4. Sturgeon Lake	Kereco
5. Carson Creek	Pengrowth
6. Holmberg (Strome)	CNRL
7. Wilson Creek	Imperial
8. Strachan	Keyera
9. Big Bend	CNRL
10. Enchant	Taylor Management
11. Gold Creek	CNRL
12. Spirit River	Bonavista
13. Boundary Lake South	Talisman
14. Waterton	Shell (2009)

Grandfathered plants that have ceased operating

Plant name	Operator
1. North Rosevear	Suncor
2. Bittern Lake	CNRL
3. North Caroline	BP Canada
4. South Caroline	BP Canada
5. Harmattan - Elkton	Bonavista
6. Leduc - Woodbend	Imperial

(continued)

Plant name	Operator
7. West Drumheller	Penn West
8. Carstairs	Bonavista
9. Zama 1	Apache (2009)

A detailed list of plants that have been degrandfathered in the last nine years is in Appendix 3, along with the process used for improving the sulphur recovery.

As of December 2009, there are 12 grandfathered sulphur recovery plants and 9 grandfathered acid gas flaring plants remaining (see Appendices 2.1 and 2.2).

Appendix 2.1 Grandfathered Sulphur Recovery (SR) Gas Plants, 2009

		Plant Code	Current Approved Sulphur Recovery Efficiency (%)	Guideline Recovery for Approved Sulphur Inlet (%)	Approved S Inlet (t/d)	Baseline Capacity 1999 S Inlet (t/d)	Change in Status (from ID 2001-03)
1	Balzac (Crossfield) - Nexen Inc.	1050	98.0	98.5	1,730.50	414.6	
2	Brazeau River - Keyera Energy Ltd.	1108	98.4	98.4	466.00	67.3	Degrandfathered in 2003; became AGI
3	Burnt Timber - Shell Canada Limited	1131	96.5	98.4	560.00	412.4	
4	Caroline North (Caroline) - BP Canada Energy Company	1374	69.7	69.7	5.00	5.0	Plant shut down in 2003
5	Caroline South (Caroline) - BP Canada Energy Company	1104	85.0	89.7	9.83	6.8	Plant shut down in 2003
6	Carstairs - Bonavista Petroleum Ltd.	1020	90.0	98.2	72.70*	9.5	Plant shut down in 2008
7	Edson - Talisman Energy Inc.	1084	98.4	98.4	350.00	220.9	Degrandfathered in 2003; upgraded SR
8	Gold Creek - Canadian Natural Resources Limited	1129	95.9	95.9	49.90	64.1	Degrandfathered in 2007
9	Jumping Pound - Shell Canada Limited	1037	96.2	98.4	619.00	472.1	
10	Kaybob South 1 & 2 (Kaybob South) - Semcams ULC	1107	98.4	98.5	1,107.70	540.6	
11	Kaybob South 3 (Kaybob South) - Semcams ULC	1144	98.5	98.5	1,999.00	1,009.6	Degrandfathered in 2006; upgraded SR
12	Lone Pine Creek - Exxonmobil Canada Ltd. and Exxonmobil Resources Ltd.	1139	98.0	98.3	165.40	129.5	
13	Mazeppa (Okotoks) - MPP Ltd.	1530	98.4	98.4	586.60	263.4	Degrandfathered in 2002
14	Minnehik-Buck Lake - Penn West Petroleum Ltd.	1047	95.6	95.9	49.17	22.0	
15	Nordegg (Brazeau River) - Keyera Energy Ltd.	1121	95.9	95.9	49.80	38.2	Degrandfathered in 2009; became AGI
16	Ram River (Strachan) - Husky Oil Operations Limited	1141	98.1	99.5	4,660.5*	2,301.8	
17	Redwater - Arc Resources Ltd.	1028	Fluctuating	95.9	12.2*	3.1	
18	Rosevear - Suncor Energy Inc.	1206					Plant shut down; consolidation with 1268
19	Rosevear South (Rosevear) - Suncor Energy Inc.	1268	98.3	98.3	100.70	76.0	Degrandfathered in 2007; became AGI
20	Simonette - Suncor Energy Inc.	1113	98.3	98.3	120.00	92.3	Degrandfathered in 2005; upgraded SR
21	Strachan - Keyera Energy Ltd.	1133	98.4	98.4	971.10	264.9	Degrandfathered in 2005
22	Sturgeon Lake (Sturgeon Lake South) - Barrick Energy Inc.	1112	95.9	95.9	49.81	40.6	Degrandfathered in 2005
23	Teepee - Talisman Energy Inc.	1296	92.0	95.9	25.00	17.5	
24	Waterton - Shell Canada Limited	1056	98.7	98.5	1,450.00	2,099.6	Degrandfathered in 2009, upgraded SR
25	West Whitecourt (Windfall) - Semcams ULC	1034	98.3	98.5	1,356.00	777.6	
26	Wildcat Hills (Jumping Pound) - Suncor Energy Inc.	1054	97.5	98.3	287.50	181.3	
27	Wimborne - Penn West Petroleum Ltd.	1081	95.5	98.3	235.00	182.1	
28	Zama 1 (Zama) - Apache Canada Ltd.	1219	92.0	98.2	80.30	38.6	Plant shut down in 2009; acid gas now going to 1878

* Annual average sulphur inlet.

Appendix 2.2 Grandfathered Acid Gas Flaring Plants, 2009

		Plant Code	Guideline Recovery for Approved Sulphur Inlet (%)	2009 S Emissions (t/d)	Approved S Inlet (t/d)	Baseline Capacity 1999 S Inlet (t/d)	Change in Status (from ID 2001-03)
1	Bantry - Altagas Ltd.	1114	89.7	0.05	9.60	1.0	Degrandfathered in 2002; became AGI in 2009
2	Bellshill Lake - Harvest Operations Corp.	1280	89.7	0.01	5.77	3.8	Degrandfathered in 2005; became AGI
3	Big Bend - Canadian Natural Resources Limited	1293	0	0.03	0.67	1.0	Degrandfathered in 2006
4	Bigoray - Penn West Petroleum Ltd.	1138	0	0.75	1.70	1.8	
5	Bittern Lake - Canadian Natural Resources Limited	1124	69.7		2.48	1.0	Plant shut down in 2000
6	Boundary Lake South - Talisman Energy Inc.	1024	0	0.34	0.99	1.0	Degrandfathered in 2008
7	Carson Creek - Pengrowth Corporation	1062	0	0.32	0.83	1.0	Degrandfathered in 2004
8	Enchant - Taylor Management Inc.	1039	0	0.29	0.99	1.0	Degrandfathered in 2006
9	Forestburg - Signalta Resources Limited	1365	69.7	0.46	4.50	4.0	
10	Galloway (Ansell) - Canadian Natural Resources Limited	1417	69.7	0.22	1.40	1.3	
11	Greencourt - Canadian Natural Resources Limited	1127	69.7	0.88	1.00	1.3	
12	Harmattan-Elkton[1] - Bonavista Petroleum Ltd.	1083	0		0.53	1.0	Plant shut down; operating as compressor
13	Hope Creek (Virginia Hills) - Apache Canada Ltd.	1135	95.9	0.08	16.00	5.2	Degrandfathered in 2004; became AGI
14	Judy Creek (Swan Hills South) - Pengrowth Corporation	1069	69.7	0.05	3.75	2.7	Degrandfathered in 2006; became AGI
15	Kaybob - Trilogy Resources Ltd.	1058	89.7	0.88	5.15	1.0	
16	Leduc-Woodbend - Imperial Oil Resources Limited	1023	69.7		1.01	1.0	Plant shut down in 2006
17	Neptune (Boundary Lake South) - Penn West Petroleum Ltd.	1202	69.7	0.80	1.63	1.1	
18	Sedgewick (Killam) - Altagas Ltd.	1510	69.7	0.91	1.99	2.2	
19	Spirit River - Bonavista Petroleum Ltd.	1560	0	0.44	0.99	1.0	Degrandfathered in 2007
20	Strome Holmberg (Holmberg) - Canadian Natural Resources Limited	1179	0	0.21	0.61	1.6	Degrandfathered in 2005
21	Sylvan Lake - NAL Resources Limited	1070	0	0.20	0.75	1.0	Degrandfathered in 2002
22	Travers (Little Bow) - Bonavista Petroleum Ltd.	1150	69.7	0.40	1.50	1.2	
23	Turin (Retlaw) - Taylor Management Inc.	1191	69.7	0.02	4.64	1.7	Degrandfathered in 2004; became AGI
24	Vulcan (Long Coulee) - Conocophillips Canada Resources Corp.	1100	69.7	0.03	4.90	2.7	Degrandfathered in 2002; became AGI
25	West Drumheller - Sirius Energy Inc.	1109	69.7		2.99	1.1	Plant shut down in 2007
26	Whitecourt - TAQA North Ltd.	1115	89.7	1.55	7.50	3.5	
27	Wilson Creek - Imperial Oil Resources Limited	1399	0	0.00	0.95	1.0	Degrandfathered in 2005
28	Wilson Creek - Suncor Energy Inc.	1096	85.0	0.12	4.70	2.3	Degrandfathered in 2001; became SR

[1] Now operating as a compressor.

Appendix 2.3 Nongrandfathered Sulphur Recovery Plants, 2009

		Plant Code	Current Approved Sulphur Recovery Efficiency (%)	Approved S Inlet (t/d)
1	Brazeau River - Blaze Energy Ltd.	1482	98.4	500.00
2	Carbondale (Morinville) - ATCO Midstream Ltd.	1638	69.7	1.15*
3	Caroline - Shell Canada Limited	1662	99.5	5,445.00
4	Coleman (Undefined) - Devon Canada Corporation	1051	98.6	800.00
5	Crossfield East - TAQA North Ltd.	1079	98.4	863.82
6	Hanlan-Robb (Basing) - Suncor Energy Inc.	1360	98.5	1,270.00
7	Harmattan-Elkton - Taylor Processing Inc.	1060	95.9	49.99
8	Hays - Canadian Natural Resources Limited	1585	90.0	9.90
9	Homeglen-Rimbey - Keyera Energy Ltd.	1004	98.3	150.00
10	Hythe Brainard (Sinclair) - Encana Oil & Gas Co. Ltd.	1147	98.3	127.80
11	Nevis - Keyera Energy Ltd.	1002	98.4	300.00
12	Olds (Garrington) - Pengrowth Corporation	1021	98.4	404.90
13	Progress - Canadian Natural Resources Limited	1506	96.5	49.50
14	Progress - Suncor Energy Inc.	1629	69.7	2.51
15	Quirk Creek - Imperial Oil Resources Limited	1134	98.3	306.40*
16	Rainbow - Altagas Ltd.	1658	95.9	23.18
17	Rainbow[1] - Husky Oil Operations Limited	1105	98.3	213.49
18	Sexsmith (La Glace) - Encana Oil & Gas Co. Ltd.	1892	98.4	483.10
19	Swalwell[2] - TAQA North Ltd.	1654	69.7	4.60
20	West Pembina (Brazeau River) - Keyera Energy Ltd.	1458	98.4	520.00

* Annual average sulphur inlet.

[1] Started as an AGI facility in January 2002.

[2] Started as an AGI facility in August 2005.

Appendix 2.4. Nongrandfathered Acid Gas Injection Plants Processing >1 t/d of Sulphur, 2009

	Nongrandfathered acid gas injection plants	Plant Code	Sulphur Recovery Equivalent Required (%)	Approved S Inlet (t/d)	2009 S Emissions (t/d)	2009 Sulphur Injected (t/d)
1	Acheson - Penn West Petroleum Ltd.	1628	98.2	90.20	0.04	2.16
2	Bigoray - Keyera Energy Ltd.	1357	98.2	64.00	0.07	21.57
3	Bistcho Lake (Bistcho) - Paramount Resources Ltd.	1975	95.9	25.00	0.29	7.85
4	Calmar (Leduc-Woodbend) - MEC Operating Company ULC	1676	95.9	15.50	0.01	2.20
5	Clear Hills (Boundary Lake South) - Canadian Natural Resources Limited	1880	95.9	38.04	0.06	8.48
6	Dunvegan - Devon Canada Corporation	1169	89.7	9.90	0.01	0.56
7	Fourth Creek (Mulligan) - Spectra Energy Midstream Corporation	1895	89.7	10.00	0.06	7.37
8	Golden Spike - ATCO Midstream Ltd.	1547	95.9	26.46	0.01	1.67
9	Gordondale - Spectra Energy Midstream Corporation	1668	98.2	54.31	0.11	29.10
10	Hansman Lake (Provost) - Husky Oil Operations Limited	1698	89.7	6.90	0.00	3.59
11	Hastings Coulee (Galahad) - Husky Oil Operations Limited	1690	89.7	10.90	0.00	1.32
12	Holmberg (Kelsey) - Sword Energy Inc.	1244	69.7	3.07	0.00	0.00
13	Marlowe (Dizzy) - Bearspaw Petroleum Ltd.	1765	95.9	20.90	0.00	0.00
14	Mitsue[1] - Penn West Petroleum Ltd.	1123	69.7	4.60	0.00	0.17
15	Normandville - Devon Canada Corporation	1990	69.7	1.90	0.00	0.06
16	O'Chiese (Pembina) - Conocophillips Canada Resources Corp.	1970	95.9	14.53	0.01	0.70
17	Paddle River - Keyera Energy Ltd.	1089	69.7	1.50	0.00	0.35
18	Pembina - Imperial Oil Resources Limited	1625	89.7	7.23	0.02	2.73
19	Pembina - Keyera Energy Ltd.	1402	95.9	29.70*	0.02	2.04
20	Pouce Coupe - Spectra Energy Midstream Corporation	1746	95.9	26.18	0.02	6.53
21	Puskwaskau - Devon Canada Corporation	1964	89.7	5.15	0.00	0.10
22	Rainbow - Exxonmobil Canada Ltd. and Exxonmobil Resources Ltd.	1155	95.9	20.10*	0.00	3.77
23	Rycroft - Birchcliff Energy Ltd.	1793	95.9	21.00	0.06	3.02
24	Steen River (Dizzy) - Steen River Oil & Gas Ltd.	1738	95.9	34.40	0.02	1.08
25	Thompson Lake (Provost) - Husky Oil Operations Limited	1695	95.9	12.00	0.02	4.31
26	Wayne-Rosedale - Encana Corporation	1888	89.7	5.90*	0.02	0.81
27	Wembley - Conocophillips Canada Resources Corp.	1520	98.3	124.00	0.03	59.29
28	West Culp (Eaglesham North) - Devon Canada Corporation	1775	95.9	17.20	0.00	0.37
29	Wizard Lake (Watelete) - ATCO Midstream Ltd.	1672	69.7	3.30	0.00	0.28
30	Zama 2 & 3 (Zama) - Apache Canada Ltd. (1878 & 1978 amalgamated)	1878	98.3	247.00	0.04	23.67

* Annual average sulphur inlet.

[1] Previously a nongrandfathered acid gas flaring plant that had emissions of less than 1 t/d and is now an AGI facility.

Grandfathered and nongrandfathered sulphur recovery or acid gas flaring plants that are now AGI facilities

31	Bantry - Altagas Ltd.	1114	89.7	9.60	0.05	0.90
32	Bellshill Lake - Harvest Operations Corp.	1280	89.7	5.77	0.01	2.78
33	Brazeau River - Keyera Energy Ltd.	1108	98.4	466.00	0.32	180.35
34	Hope Creek (Virginia Hills) - Apache Canada Ltd.	1135	95.9	16.00	0.08	4.74
35	Judy Creek (Swan Hills South) - Pengrowth Corporation	1069	69.7	3.75	0.05	2.18
36	Nordegg (Brazeau River) - Keyera Energy Ltd.	1121	95.9	49.80	0.92	2.43
37	Rainbow - Husky Oil Operations Limited	1105	98.3	213.49	1.23	128.45
38	Rosevear South (Rosevear) - Suncor Energy Inc.	1268	98.3	100.70	0.09	43.08
39	Swalwell - TAQA North Ltd.	1654	69.7	4.60	0.00	0.00
40	Turin (Retlaw) - Taylor Management Inc.	1191	69.7	4.64	0.02	1.83
41	Vulcan (Long Coulee) - Conocophillips Canada Resources Corp.	1100	69.7	4.90	0.03	0.92

Appendix 3. Plants That Have Been Degrandfathered

	Plants that have made modifications	Plant Code	Plant Name	Approved S Inlet (t/d)	Modification Process
1	Plant Mods	1108	Brazeau R. - Keyera	400.00	(AGI)
2	Plant Mods	1021	Garrington (Olds) - Pengrowth	404.90	(SuperClaus)
3	Plant Mods	1004	Homeglen Rimbey - Keyera	150.00	(SuperClaus)
4	Plant Mods	1114	Bantry - AltaGas	9.60	(AGI)
5	Plant Mods	1100	Vulcan - ConocoPhillips	4.90	(AGI)
6	Plant Mods	1096	Wilson Creek - Petro-Canada	4.70	(Claus)
7	Plant Mods	1105	Rainbow - Husky	213.50	(AGI)
8	Plant Mods	1084	Edson - Talisman	350.00	(SuperClaus)
9	Plant Mods	1191	Retlaw (Turin) - Taylor Management	4.64	(AGI)
10	Plant Mods	1135	Virginia Hills (Hope Creek) - Apache	16.00	(AGI)
11	Plant Mods	1280	Bellshill Lake - Harvest Operations	5.77	(AGI)
12	Plant Mods	1113	Simonette - Suncor	120.00	(SuperClaus)
13	Plant Mods	1069	Swan Hills South (Judy Creek) - Pengrowth	3.75	(AGI)
14	Plant Mods	1144	Kaybob S. 3 - Semcams	1,999.00	(SuperClaus)
15	Plant Mods	1268	Rosevear (South) - Suncor	100.70	(AGI)
16	Plant Mods	1121	Nordegg (Brazeau River) - Keyera	49.80	(AGI)

Plants that have been relicensed to higher sulphur recovery efficiency or lower sulphur inlets

1	Relicensed	1530	Okotoks (Mazeppa) - MPP	586.60
2	Relicensed	1079	Crossfield E. - Primewest	863.82
3	Relicensed	1070	Sylvan Lake - NAL Resources	0.75
4	Relicensed	1112	Sturgeon Lake - Cadence	49.81
5	Relicensed	1062	Carson Creek - Pengrowth	0.83
6	Relicensed	1179	Holmberg (Strome Holmberg) - CNRL	0.61
7	Relicensed	1399	Wilson Creek - Imperial	0.95
8	Relicensed	1133	Strachan - Keyera	971.10
9	Relicensed	1293	Big Bend - CNRL	0.67
10	Relicensed	1039	Enchant - Taylor Management	0.99
11	Relicensed	1129	Gold Creek - CNRL	49.90
12	Relicensed	1560	Spirit River - Bonavista	0.99
13	Relicensed	1024	Boundary Lake - Talisman	0.99
14	Relicensed	1056	Waterton - Shell	1450.00

Appendix 4.1. Gas Plants with Sulphur Recovery, Year 2009 Minus Year 2000

	Plant Code	Field-Licensee	Change in production and emissions year 2009 minus year 2000 2009-2000 S Production (t/y)	2009-2000 S Emissions (t/y)
Grandfathered plants (in 2001)				
1	1141	Ram River (Strachan) - Husky Oil Operations Limited	(472,732.9)	(5,530.8)
2	1144	Kaybob South 3 (Kaybob South) - Semcams ULC	(160,294.3)	(4,641.0)
3	1056	Waterton - Shell Canada Limited	(498,124.0)	(3,940.0)
4	1034	West Whitecourt (Windfall) - Semcams ULC	(205,077.8)	(3,703.3)
5	1037	Jumping Pound - Shell Canada Limited	5,533.8	(2,202.1)
6	1108	Brazeau River - Keyera Energy Ltd.	(35,158.5)	(2,034.2)
7	1131	Burnt Timber (Undefined) - Shell Canada Limited	(7,016.1)	(1,761.5)
8	1107	Kaybob South 1 & 2 (Kaybob South) - Semcams ULC	(176,796.3)	(1,697.4)
9	1050	Balzac (Crossfield) - Nexen Inc.	(52,626.5)	(1,251.1)
10	1081	Wimborne - Penn West Petroleum Ltd.	(33,647.8)	(1,019.2)
11	1084	Edson - Talisman Energy Inc.	2,057.0	(653.8)
12	1219	Zama 1 (Zama) - Apache Canada Ltd.	(14,405.1)	(583.9)
13	1113	Simonette - Suncor Energy Inc.	(11,111.3)	(512.6)
14	1206	Rosevear - Suncor Energy Inc.	(12,290.7)	(499.6)
15	1054	Wildcat Hills (Jumping Pound) - Suncor Energy Inc.	(22,997.5)	(483.7)
16	1268	Rosevear South (Rosevear) - Suncor Energy Inc.	(18,426.7)	(426.1)
17	1121	Nordegg (Brazeau River)* - Keyera Energy Ltd.	(7,785.1)	(393.9)
18	1112	Sturgeon Lake (Sturgeon Lake South) - Barrick Energy Inc.	(7,735.4)	(385.8)
19	1104	Caroline South (Caroline) - BP Canada Energy Company	(2,186.0)	(349.5)
20	1020	Carstairs - Bonavista Petroleum Ltd.	(3,370.0)	(324.6)
21	1530	Mazeppa (Okotoks) - MPP Ltd.	(17,813.4)	(269.1)
22	1129	Gold Creek - Canadian Natural Resources Limited	(12,391.3)	(241.8)
23	1139	Lone Pine Creek - Exxonmobil Canada Ltd. and Exxonmobil Resources Ltd.	(13,823.5)	(232.6)
24	1047	Minnehik-Buck Lake - Penn West Petroleum Ltd.	(4,103.8)	(167.3)
25	1296	Teepee - Talisman Energy Inc.	(842.7)	(159.9)
26	1374	Caroline North (Caroline) - BP Canada Energy Company	(903.1)	(86.8)
27	1028	Redwater - Arc Resources Ltd.	(334.8)	30.9
28	1133	Strachan - Keyera Energy Ltd.	107,863.7	644.7
	Totals		**(1,676,540.0)**	**(32,875.9)**

*Nordegg (Brazeau River) became an AGI facility in October 2009. Injected sulphur volumes in 2009 were 886.6 t/y.

Grandfathered plants that were previously acid gas flaring and are now sulphur recovery

1	1096	Wilson Creek - Suncor Energy Inc.	341.0	994.2
	Totals		**341.0**	**994.2**

Nongrandfathered plants (plants meeting the requirements for new plants)

1	1079	Crossfield East - TAQA North Ltd.	(89,268.3)	(2,160.1)
2	1360	Hanlan-Robb (Basing) - Suncor Energy Inc.	(125,824.3)	(2,033.8)
3	1021	Olds (Garrington) - Pengrowth Corporation	(20,719.7)	(1,166.6)
4	1662	Caroline - Shell Canada Limited	(874,684.5)	(1,050.3)
5	1004	Homeglen-Rimbey - Keyera Energy Ltd.	(7,883.7)	(934.9)
6	1105	Rainbow - Husky Oil Operations Limited	(22,351.5)	(675.2)
7	1892	Sexsmith (La Glace) - Encana Oil & Gas Co. Ltd.	(32,616.2)	(355.0)
8	1002	Nevis - Keyera Energy Ltd.	(24,695.8)	(291.2)
9	1051	Coleman (Undefined) - Devon Canada Corporation	(33,824.1)	(247.6)
10	1458	West Pembina (Brazeau River) - Keyera Energy Ltd.	(10,153.5)	(233.2)
11	1654	Swalwell - TAQA North Ltd.	(533.4)	(138.9)
12	1045	Bonnie Glen - Imperial Oil Resources Limited	(3,062.0)	(125.7)
13	1147	Hythe Brainard (Sinclair) - Encana Oil & Gas Co. Ltd.	(12,261.0)	(86.6)
14	1585	Hays - Canadian Natural Resources Limited	(457.6)	(62.0)
15	1482	Brazeau River - Blaze Energy Ltd.	(15,016.1)	(51.6)
16	1506	Progress - Canadian Natural Resources Limited	2,413.5	(25.1)
17	1060	Harmattan-Elkton - Taylor Processing Inc.	(5,462.1)	(9.1)
18	1638	Carbondale (Morinville) - ATCO Midstream Ltd.	(328.1)	(0.2)
19	1629	Progress - Suncor Energy Inc.	52.7	0.0
20	1658	Rainbow - Altagas Ltd.	1,261.5	12.4
21	1134	Quirk Creek - Imperial Oil Resources Limited	(15,622.7)	115.1
	Totals		**(1,291,036.8)**	**(9,519.3)**

		Grand totals	**(2,967,576.8)**	**(41,401.0)**

Appendix 4.2. Gas Plants with Sulphur Recovery, Year 2000

	Plant Code	Field-Licensee	Total Inlet (t/y)	Total Annual Emissions (t/y)	Actual Sulphur Recovery Effic. (%)	Current Approved Sulphur Recovery Effic. (%)	Total Annual Production (t/y)
Grandfathered plants (in 2001)							
1	1141	Ram River (Strachan) - Husky Oil Operations Limited	791,052.9	7,877.7	99.0	98.1	781,009.3
2	1144	Kaybob South 3 (Kaybob South) - Semcams ULC	360,565.8	6,646.1	98.2	98.1	369,708.4
3	1056	Waterton - Shell Canada Limited	671,377.4	6,233.1	99.1	98.7	679,224.2
4	1034	West Whitecourt (Windfall) - Semcams ULC	286,311.3	4,616.6	98.4	98.3	292,237.0
5	1037	Jumping Pound - Shell Canada Limited	161,744.1	5,509.7	96.6	96.2	158,522.1
6	1108	Brazeau River - Keyera Energy Ltd.	36,697.0	2,152.6	94.2	92.1	35,158.5
7	1131	Burnt Timber (Undefined) - Shell Canada Limited	156,959.7	4,844.0	96.9	96.5	152,115.5
8	1107	Kaybob South 1 & 2 (Kaybob South) - Semcams ULC	234,341.8	2,756.9	98.9	98.4	250,134.3
9	1050	Balzac (Crossfield) - Nexen Inc.	144,323.2	2,408.8	98.3	98.0	141,245.3
10	1081	Wimborne - Penn West Petroleum Ltd.	57,618.0	1,833.9	96.7	95.5	54,008.0
11	1084	Edson - Talisman Energy Inc.	73,009.3	1,421.2	98.1	97.9	73,337.4
12	1219	Zama 1 (Zama) - Apache Canada Ltd.	15,117.5	583.9	96.1	92.0	14,405.1
13	1113	Simonette - Suncor Energy Inc.	32,358.2	793.8	97.5	96.5	31,239.2
14	1206	Rosevear - Suncor Energy Inc.	10,771.6	499.6	96.1	94.6	12,290.7
15	1054	Wildcat Hills (Jumping Pound) - Suncor Energy Inc.	71,413.7	1,220.0	98.2	97.5	66,931.2
16	1268	Rosevear South (Rosevear) - Suncor Energy Inc.	16,104.4	457.5	97.6	95.6	18,426.7
17	1121	Nordegg (Brazeau River) - Keyera Energy Ltd.	12,991.3	727.9	94.6	93.5	12,842.1
18	1112	Sturgeon Lake (Sturgeon Lake South) - Barrick Energy Inc.	18,698.9	729.2	96.2	94.0	18,456.1
19	1104	Caroline South (Caroline) - BP Canada Energy Company	2,483.7	349.5	86.2	85.0	2,186.0
20	1020	Carstairs - Bonavista Petroleum Ltd.	3,815.5	324.6	91.2	90.0	3,370.0
21	1530	Mazeppa (Okotoks) - MPP Ltd.	95,120.2	1,260.7	98.7	98.3	95,760.9
22	1129	Gold Creek - Canadian Natural Resources Limited	20,071.4	514.9	97.6	97.0	20,883.0
23	1139	Lone Pine Creek - Exxonmobil Canada Ltd. and Exxonmobil Resources Ltd.	38,390.2	599.7	98.4	98.0	37,232.3
24	1047	Minnehik-Buck Lake - Penn West Petroleum Ltd.	7,018.8	270.4	96.1	95.6	6,748.4
25	1296	Teepee - Talisman Energy Inc.	5,424.7	372.2	93.2	92.0	5,070.9
26	1374	Caroline North (Caroline) - BP Canada Energy Company	1,039.2	86.8	91.2	89.7	903.1
27	1028	Redwater - Arc Resources Ltd.	1,184.9	88.3	92.7	Fluctuating	1,118.3
28	1133	Strachan - Keyera Energy Ltd.	97,769.5	1,169.6	98.8	98.1	97,129.6
	Totals		**3,423,774.2**	**56,349.3**	**98.4**		**3,431,693.7**
Grandfathered plants that were previously acid gas flaring and are now sulphur recovery							
1	1096	Wilson Creek - Suncor Energy Inc.	908.0	1,036.4	0.0		
	Totals		**908.0**	**1,036.4**	**0.0**		
Nongrandfathered plants (plants meeting the requirements for new plants)							
1	1079	Crossfield East - TAQA North Ltd.	170,668.1	3,028.6	98.2	98.0	169,921.2
2	1360	Hanlan-Robb (Basing) - Suncor Energy Inc.	299,824.2	3,434.8	98.8	98.5	288,911.9
3	1021	Olds (Garrington) - Pengrowth Corporation	103,220.0	2,152.2	97.9	97.1	101,783.0
4	1662	Caroline - Shell Canada Limited	1,833,270.9	2,458.5	99.9	99.8	1,844,827.3
5	1004	Homeglen-Rimbey - Keyera Energy Ltd.	19,957.4	1,003.0	94.8	92.0	18,208.7
6	1105	Rainbow - Husky Oil Operations Limited	25,910.0	1,123.5	95.2	95.0	22,351.5
7	1892	Sexsmith (La Glace) - Encana Oil & Gas Co. Ltd.	125,906.9	1,292.2	99.0	98.4	126,382.7
8	1002	Nevis - Keyera Energy Ltd.	37,590.7	467.5	98.8	98.4	37,091.8
9	1051	Coleman (Undefined) - Devon Canada Corporation	137,197.0	1,369.9	99.0	98.6	136,352.7
10	1458	West Pembina (Brazeau River) - Keyera Energy Ltd.	107,983.1	1,624.1	98.6	98.4	112,615.2
11	1654	Swalwell - TAQA North Ltd.	517.6	138.9	79.3	70.0	533.4
12	1045	Bonnie Glen - Imperial Oil Resources Limited	3,281.6	125.7	96.1	95.9	3,062.0
13	1147	Hythe Brainard (Sinclair) - Encana Oil & Gas Co. Ltd.	28,431.8	296.2	99.0	98.3	28,291.8
14	1585	Hays - Canadian Natural Resources Limited	2,390.2	129.0	94.5	90.0	2,217.5
15	1482	Brazeau River - Blaze Energy Ltd.	97,601.0	917.1	99.1	98.4	96,505.4
16	1506	Progress - Canadian Natural Resources Limited	9,215.7	237.8	97.4	96.5	9,060.8
17	1060	Harmattan-Elkton - Taylor Processing Inc.	11,515.1	164.6	98.6	98.6	11,875.6
18	1638	Carbondale (Morinville) - ATCO Midstream Ltd.	364.6	0.2	100.0	69.7	403.5
19	1629	Progress - Suncor Energy Inc.	389.1	0.0	100.0	69.7	336.7
20	1658	Rainbow - Altagas Ltd.	1,882.0	127.9	92.6	70.0	1,597.4
21	1134	Quirk Creek - Imperial Oil Resources Limited	86,771.0	1,002.1	98.9	98.3	90,372.6
	Totals		**3,103,887.8**	**21,093.7**	**99.3**		**3,102,702.7**
		Grand totals	**6,528,570.0**	**78,479.4**	**98.8**		**6,534,396.4**

Appendix 4.3. Gas Plants with Sulphur Recovery, Year 2009

	Plant Code	Field-Licensee	Total Inlet (t/y)	Total Annual Emissions (t/y)	Actual Sulphur Recovery Effic. (%)	Current Approved Sulphur Recovery Effic. (%)	Total Annual Production (t/y)
Grandfathered plants (in 2001)							
1	1141	Ram River (Strachan) - Husky Oil Operations Limited	311,270.5	2,346.9	99.2	98.1	308,276.4
2	1144	Kaybob South 3 (Kaybob South) - Semcams ULC	210,948.8	2,005.1	99.1	98.5	209,414.1
3	1056	Waterton - Shell Canada Limited	181,444.1	2,293.2	98.7	98.7	181,100.2
4	1034	West Whitecourt (Windfall) - Semcams ULC	87,446.2	913.3	99.0	98.3	87,159.2
5	1037	Jumping Pound - Shell Canada !.imited	169,248.8	3,307.6	98.0	96.2	164,055.9
6	1108	Brazeau River - Keyera Energy Ltd.	67,172.4	118.4	99.8	98.4	Injected (65,828.6)
7	1131	Burnt Timber (Undefined) - Shell Canada Limited	145,667.8	3,082.5	97.9	96.5	145,099.4
8	1107	Kaybob South 1 & 2 (Kaybob South) - Semcams ULC	75,243.8	1,059.6	98.6	98.4	73,338.0
9	1050	Balzac (Crossfield) - Nexen Inc.	91,420.0	1,157.7	98.7	98.0	88,618.8
10	1081	Wimborne - Penn West Petroleum Ltd.	22,163.6	814.7	96.2	95.5	20,360.2
11	1084	Edson - Talisman Energy Inc.	74,988.4	767.4	99.0	98.4	75,394.5
12	1219	Zama 1 (Zama) - Apache Canada Ltd.	0.0	0.0		92.0	0.0
13	1113	Simonette - Suncor Energy Inc.	20,397.7	281.2	98.6	98.3	20,127.9
14	1206	Rosevear - Suncor Energy Inc.	0.0	0.0		94.6	0.0
15	1054	Wildcat Hills (Jumping Pound) - Suncor Energy Inc.	44,660.9	736.3	98.4	97.5	43,933.7
16	1268	Rosevear South (Rosevear) - Suncor Energy Inc.	15,569.8	31.4	99.8	98.3	Injected (15,726.0)
17	1121	Nordegg (Brazeau River) - Keyera Energy Ltd.	6,277.7	334.0	94.7	95.9	5,057.0
18	1112	Sturgeon Lake (Sturgeon Lake South) - Barrick Energy Inc.	11,102.3	343.4	96.9	95.9	10,720.7
19	1104	Caroline South (Caroline) - BP Canada Energy Company	0.0	0.0		69.7	0.0
20	1020	Carstairs - Bonavista Petroleum Ltd.	0.0	0.0		90.0	0.0
21	1530	Mazeppa (Okotoks) - MPP Ltd.	78,745.7	991.6	98.7	98.4	77,947.5
22	1129	Gold Creek - Canadian Natural Resources Limited	8,641.4	273.2	96.9	95.9	8,491.7
23	1139	Lone Pine Creek - Exxonmobil Canada Ltd. and Exxonmobil Resources Ltd.	23,419.3	367.1	98.5	98.0	23,408.8
24	1047	Minnehik-Buck Lake - Penn West Petroleum Ltd.	2,715.9	103.1	96.2	95.6	2,644.6
25	1296	Teepee - Talisman Energy Inc.	4,439.3	212.3	95.2	92.0	4,228.2
26	1374	Caroline North (Caroline) - BP Canada Energy Company	0.0	0.0		85.0	0.0
27	1028	Redwater - Arc Resources Ltd.	893.2	119.1	86.8	Fluctuating	783.5
28	1133	Strachan - Keyera Energy Ltd.	211,805.8	1,814.3	99.1	98.4	204,993.3
	Totals		**1,865,683.1**	**23,473.4**	**98.7**		**1,755,153.7**
Grandfathered plants that were previously acid gas flaring and are now sulphur recovery							
1	1096	Wilson Creek - Suncor Energy Inc.	417.7	42.2	89.0	85.0	341.0
	Totals		**417.7**	**42.2**	**89.0**		**341.0**
Nongrandfathered plants (plants meeting the requirements for new plants)							
1	1079	Crossfield East - TAQA North Ltd.	80,772.4	868.5	98.9	98.4	80,652.9
2	1360	Hanlan-Robb (Basing) - Suncor Energy Inc.	163,014.4	1,401.1	99.1	98.5	163,087.6
3	1021	Olds (Garrington) - Pengrowth Corporation	81,934.7	985.6	98.8	98.4	81,063.3
4	1662	Caroline - Shell Canada Limited	947,623.7	1,408.2	99.9	99.5	970,142.8
5	1004	Homeglen-Rimbey - Keyera Energy Ltd.	10,449.6	68.1	99.3	98.3	10,325.0
6	1105	Rainbow - Husky Oil Operations Limited	42,677.6	448.3	99.1	98.3	Injected (46,882.9)
7	1892	Sexsmith (La Glace) - Encana Oil & Gas Co. Ltd.	92,559.9	937.3	99.0	98.4	93,766.5
8	1002	Nevis - Keyera Energy Ltd.	13,282.8	176.3	98.6	98.4	12,396.0
9	1051	Coleman (Undefined) - Devon Canada Corporation	102,159.4	1,122.3	98.9	98.6	102,528.6
10	1458	West Pembina (Brazeau River) - Keyera Energy Ltd.	101,515.0	1,390.9	98.7	98.4	102,461.7
11	1654	Swalwell - TAQA North Ltd.	0.0	0.0		69.7	0.0
12	1045	Bonnie Glen - Imperial Oil Resources Limited	0.0	0.0			0.0
13	1147	Hythe Brainard (Sinclair) - Encana Oil & Gas Co. Ltd.	16,273.7	209.6	98.7	98.3	16,030.9
14	1585	Hays - Canadian Natural Resources Limited	1,873.1	67.0	96.3	90.0	1,759.9
15	1482	Brazeau River - Blaze Energy Ltd.	82,019.5	865.5	98.9	98.4	81,489.3
16	1506	Progress - Canadian Natural Resources Limited	12,193.5	212.7	98.2	96.5	11,474.3
17	1060	Harmattan-Elkton - Taylor Processing Inc.	6,493.5	155.5	97.6	95.9	6,413.6
18	1638	Carbondale (Morinville) - ATCO Midstream Ltd.	73.0	0.0	100.0	69.7	75.4
19	1629	Progress - Suncor Energy Inc.	341.1	0.0	100.0	69.7	389.4
20	1658	Rainbow - Altagas Ltd.	2,941.7	140.2	95.3	95.9	2,858.9
21	1134	Quirk Creek - Imperial Oil Resources Limited	73,237.8	1,117.2	98.5	98.3	74,749.9
	Totals		**1,831,436.1**	**11,574.4**	**99.4**		**1,811,665.9**
		Grand totals	**3,697,536.9**	**35,089.9**	**99.0**		**3,567,160.6**

Appendix 5. Sulphur Credits Earned

			Credits				Cumulative Credits				
			Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Status
Grandfathered sulphur recovery gas plants											
1	1108	Brazeau R. - Keyera									Degrandfathered
2	1121	Brazeau River (Nordegg) - Keyera	2.2	15.9	7.5		703.8	719.8	727.3	727.3	Degrandfathered
3	1131	Burnt Timber - Shell	267.1	288.5	177.7	128.3	2,590.9	2,879.4	3,057.1	3,185.4	
4	1374	Caroline 1-11 - BP Canada									Plant shut down
5	1104	Caroline 4-20 - BP Canada									Plant shut down
6	1020	Carstairs - Bonavista					293.5	293.5	293.5	293.5	Plant shut down
7	1050	Balzac (Crossfield) - Nexen	112.9	132.4	193.1	191.6	2,709.0	2,841.4	3,034.5	3,226.1	
8	1084	Edson - Talisman					122.2	122.2	122.2	122.2	Degrandfathered
9	1129	Gold Creek - CNRL					189.5	189.5	189.5	189.5	Degrandfathered
10	1037	Jumping Pound - Shell	443.6	479.5	335.6	147.5	9,820.9	10,300.4	10,636.1	10,783.5	
11	1107	Kaybob S. 1 & 2 - Semcams	-2.4	51.7	42.1	42.1	3,879.6	3,931.3	3,973.3	4,015.4	
12	1144	Kaybob S. 3 - Semcams					3,213.9	3,213.9	3,213.9	3,213.9	Degrandfathered
13	1139	Lone Pine Ck. - ExxonMobil	32.4	26.4	13.9	35.1	478.2	504.6	518.5	553.6	
14	1047	Minnehik B. L. - Penn West	6.7	3.9	3.5	3.5	165.4	169.3	172.8	176.3	
15	1530	Okotoks (Mazepa) - MPP									Degrandfathered
16	1028	Redwater - Arc	4.2	13.1	39.1	40.1	604.6	617.7	656.8	696.9	Variable inlet rate
17	1206	Rosevear (North) - Suncor[1]									Plant shut down
18	1268	Rosevear (South) - Suncor[1]					1,634.7	1,634.7	1,634.7	1,634.7	Degrandfathered
19	1113	Simonette - Suncor					663.7	663.7	663.7	663.7	Degrandfathered
20	1141	Strachan - Husky	816.3	931.1	942.5	871.4	37,280.8	38,211.9	39,154.4	40,025.8	
21	1133	Strachan - Keyspan					1,229.7	1,229.7	1,229.7	1,229.7	Degrandfathered
22	1112	Sturgeon Lk. - Barrick					590.6	590.6	590.6	590.6	Degrandfathered
23	1296	Teepee - Talisman	17.2	28.9	46.2	12.1	903.6	932.5	978.7	990.9	
24	1056	Waterton - Shell	0.0	0.0			13,346.2	13,346.2	13,346.2	13,346.2	Degrandfathered
25	1054	Wildcat Hills - Suncor	86.5	81.3	63.5	79.7	3,204.5	3,285.8	3,349.4	3,429.0	
26	1081	Wimborne - Penn West	22.5	64.8	15.3	39.9	2,111.6	2,176.5	2,191.7	2,231.6	
27	1034	Windfall (West Whitecourt) - Semcams	121.7	188.3	144.5	123.0	5,685.8	5,874.1	6,018.6	6,141.7	
28	1219	Zama - Apache	0.0				982.4	982.4	982.4	982.4	Plant shut down
Totals			1,930.7	2,305.8	2,024.6	1,714.3	92,405.3	94,711.2	96,735.7	98,450.0	

[1] Plant consolidation